REMARKS

This is in response to the Official Action of April 11, 2007. Claims 1, 2-18 remain in the application. Reconsideration and allowance is respectfully requested.

Claims 1, 2, 4-8, 10 and 11 were rejected as being obvious over a combination of the Hamilton et al. patent 5,582,235, in view of Gabuzda et al. patent 4,851,965. Essentially the Examiner held that the valve system of Hamilton et al. included "controllable valves 100a-100n positioned above a plurality of integrated circuits 25a-25n", a control for the valves including an electric motor and a controller operated in response to individual temperature sensors on each of the integrated circuits. Gabuzda et al. was cited to show a circuit board with an air chamber over the circuit boards and uncontrolled openings above the circuit boards for cooling purposes. It was held obvious to modify Hamilton et al. by using the chambers of Gabuzda et al. with controllable valves at each opening.

However, the Hamilton '235 device illustrates and teaches the use of separate individual lines or conduits carrying flow from a main conduit from a blower, coupled with a cooling system. The teachings of the Hamilton patent only relates to a system of conduits 50, 51, 52 and 53 leading from a blower. Main cross conduit 53 is connected to the nozzle assemblies 40a-40n. There is no suggestion of being able to control the flow from a plenum that contains a volume of relatively low pressure air and which overlies the actual circuit boards being tested.

The use of a tray in a burn-in oven to define a plenum chamber above the heat exchange chamber combined with individual valves at openings in the tray is certainly not shown or suggested in Hamilton et al. The use of such a dividing wall to provide a plenum in the high temperature oven was not suggested. There is no suggestion that the arrangement of a plenum would

work. Each of the independent claims recite that each opening in the tray forming the plenum is associated one device under test, which is also controlled as to heating as well as cooling. The air flows down onto the device under test.

Moreover, the valves 100a-100n cited by the Examiner are not "on the tray" as provided in independent claim 1, nor are they "attached to the valve tray" as provided in independent claim 6. The mounting of the valves on the tray provides new and non-obvious structure that permits good air flow control. Additionally, Gabuzda et al. does not disclose the use of valves to control air flow from the plenums 25m through the openings 30m and, more particularly, valves coupled to a wall of the plenums 25m. Accordingly, independent claims 1 and 6 are non-obvious in view of the cited references, because the cited references do not teach or suggest all of the claimed elements.

Further, Gabuzda et al. is only a cooling device for circuits on circuit boards. There is no concern of maintaining a controlled, elevated temperature with a heater, and controlling air with valves to maintain a test temperature within a desired range. With the present device, air flow can be turned off completely, which is impossible with the device of Gabuzda et al. inasmuch as fixed openings are provided. A fixed opening orifice can be selected in Gabuzda et al., this is not in any way an adequate control for burn-in tests where the circuit chip being tested has to be maintained on an elevated temperature, for example, a 130°C over a test span. In some instances, a heater for the holder of the chip as well as the air flow from the plenum chamber overlying the chip holder is needed. The Gabuzda et al. device is not a burn-in board or burn-in oven arrangement, and is concerned only with providing air that will cool internally generated heat of components on a circuit board when the components are in operation.

The problem with the properly controlled temperature for a test chip has increased since the power would be dissipated has increased, as the newer chips are designed to consume more and more power.

Enclosed for background information is a printout of a discussion presented by Harold E. Hamilton, one of the inventors, entitled, "THERMAL ASPECTS OF BURN-IN OF HIGH POWERED SEMICONDUCTOR DEVICES" presented at the "Proceedings from the Eighth Intersociety Conference on Thermal and Thermal Mechanical Phenomenon in Electronic Systems" in San Diego, California (ISBN 0-78-03-7152-6).

The various developments that have occurred in burn-in test devices as power has increased is described. A "fan tray" device described in U.S. Patent Application 10/020,348 (Publication No. 2003/0112025), and cited herein, was also mentioned.

The fan device can only handle power outputs of devices under test of under 50 watts or so output. Also low power output devices under test (DUT), even with heaters on the devices, and with the fans off, would be cooled by air leakage through the fan and would not get up to test temperature.

It is stated in the last sentence of the Conclusion of this article, developing methods for boiling in these devices (high power devices) will be a challenge.

The challenge of higher power was answered by the use of the valves with openings from a plenum chamber, which permits blocking all flow and gives control over a wide range of power dissipation of the DUTs. Each DUT can be operated at a suitable test temperature. The valves provide control across a wide range of power dissipating devices.

Mr. Hamilton is a person of extraordinary skill, and the use of valves on the openings from a plenum to provide enhanced individual temperature controls for DUTs was not obvious

and resulted in a substantial breakthrough. The valves permit control of DUT temperature across a wider range of power dissipation by the DUTs.

It is clear there is no suggestion in Gabuzda et al. of measured temperature control or of valves. The circuits on the circuit board in Gabuzda et al. generate internal heat, and cooling is the only consideration. There is no suggestion of maintaining a temperature at a desired raised level. There is no requirement in Gabuzda et al. of maintaining an elevated temperature in the circuits, as is necessary for DUTs in a burn-in oven.

Further, nothing suggests adding a plenum in Hamilton et al. Hamilton et al. shows a cooler, hoses, and valves formed in conduit having nozzles. There is no suggestion that an air chamber or plenum that essential divides the burn in chambers would be able to provide the flow needed for cooling, and no suggestion of valves being attached to a wall of the plenum for controlling flow through openings in the wall of the plenum. Only separate conduits with valves and nozzles are suggested or shown in Hamilton et al.

The combination suggested by the Examiner thus is not provided by either of the references, when considering the scope and content of prior art, the differences between the prior art and the claimed invention, and the level of skill in the art. Controllable valves at openings through a plenum wall overlying the devices under test provide a way for obtaining much better control of the temperature at which the DUTs are to be maintained for testing.

Thus, the combination used by the Examiner is not suggested in either one of the references and the differences between the prior art and the claimed structure has provided outstanding results. Thus the combination is taught only in the present specification and is not an obvious combination. The

basic reference, the Hamilton '235 patent, does not suggest the use of a cooling air plenum above the devices under test with a valve associated with each opening and attached to a wall of the plenum. Thus, there is no suggestion of valves on a tray forming a wall of a plenum for controlling flow through each opening.

The Gabuzda et al. patent would not suggest valves to those having ordinary skill in the art. In fact, valves that reduce or stop air flow at each opening in Gabuzda et al. would defeat the object of maximum cooling to keep the circuits on the circuit board from overheating. The Gabuzda et al. patent is not concerned with maintaining any particular electronic component at any particular temperature, for testing or any other purpose, but is only concerned with dissipating the heat that is generated so that the electronic components do not become overheated. In other words, there would be no desire, reason or motivation to provide for a controllable flow of air onto component shown in the Gabuzda patent to regulate the temperature.

In Gabuzda, the intent is to maintain an adequate flow of air so that the overall cooling of the electric components as they are utilized is sufficient to ensure that they do not become overheated or damaged.

Claim 1 indicates that there are separate individual openings in the tray overlying each of the integrated circuits that is being tested, and further includes a separate, individually controlled valve on the tray so that flow through the individual openings is controlled and is directed onto a test integrated circuit. There is no teaching in either of the references of this control of flow from a plenum, that would form a path for airflow through a wall of a plenum chamber. It is respectfully submitted that claim 1 defines a non-obvious invention over a combination of Hamilton and the Gabuzda et al. patents.

Claim 2 adds details to the valving construction and it is believed allowable with claim 1. Claim 4 depends from claim 3 and specifies an electric motor that drives each valving system, and is thus believed allowable. Claim 5 includes a further sensor for sensing a temperature of the integrated circuit to make the overall combination very precise.

Independent claim 6 is allowable for the same reasons set forth in connection with claim 1, and specifies that each of the plurality of outlet openings through the valve tray is aligned with a device under test and has a valve that is "attached to the valve tray" for controlling flow onto an associated device under test. While the Hamilton '235 patent shows nozzles and a conduit arrangement, this does not require use of separate lines or conduits. Use of a plenum chamber with the tray or wall that has openings and is mounted on a burn-in oven or for burn-in purposes, is not shown in Hamilton '235.

There is no suggestion of the valve arrangement in the Gabuzda et al. device, and no suggestion of a need for a plenum chamber in Hamilton et al. Neither reference discloses valves attached to a wall of a plenum chamber.

Claims 7, 8 and 9 deal with the use of valve elements and are allowable with claim 6. Claim 10 is specific to the source of cooling air that is an air supply chamber at an end of an oven, supporting the air flow plenum. This provides an overall pressurized source of air, and does not require conduits, for example. The individual flows are controlled by valves and a tray above the devices under test, and this is contrasted to any teaching added by the Gabuzda et al. device that has no way of individually controlling the flow nor any need to do so when the device is operating. While orifices can be replaced, the flow through such orifices maintained at a rate regardless of the temperature of the circuits underneath the orifice.

Claim 11 is specific to a series of vertically stacked air flow control plenums in a burn-in oven, which is a combination of all of the elements.

Claims 3 and 9 were rejected on the combination discussed above in Hamilton et al. in view of Gabuzda et al., and further in view of the Yoo patent 6,698,718. Yoo was cited to show a rotary valve, and again is respectfully pointed out that Yoo has no valve that is associated with any circuit testing equipment or burn-in oven. Rather, the valve is used for rapid thermal processing reactor that is used to apparently reduce the amount of time that a semiconductor device is opposed to high temperatures during processing. It shows a rotary valve, but there is no teaching that this type of valve would be of use in a burn-in system where there is an individual opening in a tray overlied in a device under test and the valve is on the tray and controls flow through that opening from a plenum chamber to the device under test. Claims 3 and 9 are thus believed allowable.

Claims 12-18 were also rejected as being unpatentable over Hamilton et al., in view of Gabuzda et al. and Yoo. However, the reasons the combination of Hamilton et al. and Gubuzda et al. references does not render claim 1 obvious is relied on in relation to claims 12-18 as well. There is no teaching in these references of the use of individual openings in a wall forming a plenum chamber for directing controlled flow through a valve that is onto the devices under test. Also, the cited references do not disclose a rotary valves "each coupled to one of the valve trays adjacent one of the valve tray openings" as provided in claim 12. Further, the cited references do not suggest the control of the flow through each of the valves is in response to a testing temperature signal relating to the temperature of the device under test, as provided in claim 12.

Claims 13-18 add features to claim 12 and are allowable therewith. The arrangement of the flow of cooling air specified

in the dependent claims is not shown in the Gabuzda et al. reference.

The Examiner also provisionally rejected the claims on a non-statutory obviousness type double patenting over the Applicant's co-pending application 10/020,348 in view of Gabuzda.

In the double patenting rejection Gabuzda et al. was stated to disclose a valve in the same field of endeavor for the purposes of delivering cooling air.

It is respectfully believed that Gabuzda et al. does not in fact disclose any valves of any kind, that can be controlled as specified in these claims. Thus, it is respectfully requested that the provisional rejection on the grounds of obviousness type double patenting be reconsidered and removed.

In view of the above, it is believed that claims 1-18 are allowable and action to that effect is respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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